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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

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In the Matter of

Federal-State Joint Board on  
Universal Service

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CC Docket No. 96-45

COMMENTS

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**COMMENTS**

BellSouth Corporation, on behalf of itself and its subsidiaries ("BellSouth"), hereby submits the following comments on the Public Notice released by the Common Carrier Bureau on December 22, 1999, requesting comments on requests to redefine "voice grade access" for purposes of federal universal service support.<sup>1</sup>

**I. INTRODUCTION AND SUMMARY**

1. The Public Notice solicits comments on requests made by the Rural Utilities Service ("RUS") and certain state commissions ("state petitions") asking the Commission to amend its universal service rules and to redefine "voice grade access" by modifying the minimum frequency range for such access. The RUS request was set forth in an *ex parte* presentation made on January 27, 1998. Based on the written memorandum summarizing the meeting, RUS suggested that the voice grade access definition adopted by the Commission in the *Fourth Order On Reconsideration*<sup>2</sup> would slow down rural access to the Internet and information services. As

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<sup>1</sup> Public Notice, "Common Carrier Bureau Seeks Comment on Requests to Redefine 'Voice Grade Access' For Purposes of Federal Universal Service Support," DA 99-2985, released December 22, 1999 ("Public Notice").

<sup>2</sup> *In the Matter of Federal-State Joint Board on Universal Service, et al.*, CC Docket Nos. 96-45, et al., *Fourth Order on Reconsideration in CC Docket No. 96-45, Report and Order in* (Footnote Continued)

summarized in the Public Notice, it would also appear that the origin of the claim that some rural consumers using 28.8 kbps modems might not achieve data transmission speeds comparable to urban areas was made during this *ex parte* presentation. The state petitions merely contain a general allegation that current parameters associated with voice grade access to the public switched network could mean that rural areas might not get access to technology, such as the Internet, as quickly as non-rural areas. The petitions themselves, however, lack any specificity to explain the basis of this allegation.

2. BellSouth and others have already addressed the state petitions. The record is clear that the state petitions have not made the requisite showings to support a reconsideration request. Further, the record establishes that any modification of the standard for voice grade access would disrupt the newly crafted universal service program. As BellSouth and others made clear, such modifications would render most incumbent LECs as ineligible to receive universal service support, notwithstanding that they are the predominant providers of universal service. This type of disruptive effect is at odds with the Commission's express intent not to require eligible telecommunications carriers to meet a voice grade access standard that is more exacting than current industry standards.<sup>3</sup> Accordingly, the state petitions should be denied.

3. Nor does the Public Notice and its reference to an *ex parte* filed nearly two years ago constitute grounds for initiating a proceeding to revisit the definition of voice grade access. In the first instance, the new federal high cost fund has yet to be given a chance to get off the

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CC Docket Nos. 96-45, 96-262, 94-1, 91-213 and 95-72, 13 FCC Rcd 5318 (1997) ("*Fourth Order on Reconsideration*").

<sup>3</sup> *Fourth Order on Reconsideration*, 13 FCC Rcd at 5328.

ground. As part of the new program, the Commission gave the state commissions the responsibility to ensure that universal service receipts are used in a manner consistent with the requirements of Section 254 of the Communications Act.<sup>4</sup> The Commission recognized that circumstances and conditions vary by state, and that the state commissions are in the best position to ensure that the objectives of Section 254 are accomplished. Were the Commission to modify the definition of voice grade access, the effect would be to displace the state commissions' role in determining the proper use of the new federal funds. Either the states would lose the funds in their entirety because no incumbent carrier would be eligible to receive the funds, or, if some transition were adopted, they would be stripped of the ability to address their specific universal service needs because the funds would have to be used to reengineer existing local networks to make them compliant with the new standard.<sup>5</sup>

4. Nor would the impact on the states be limited to the manner in which federal universal service funds are disbursed. Many state commissions have been working on intrastate universal service mechanisms as permitted by Section 254. Redefining basic universal service would affect these intrastate efforts because the same voice grade access would be supported by the state funds.

5. Impact aside, it makes no sense to redefine voice grade access at this time. At the outset, the Commission is just now at the threshold of implementing its new federal universal service plan. This plan should be given a chance to operate and, then, based on actual results, the

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<sup>4</sup> 47 U.S.C. § 254.

<sup>5</sup> This latter outcome assumes that the universal service funding would be sufficient to accomplish the reengineering of the local networks that would take years to complete.

plan can be evaluated and modified, if necessary. Indeed, the Commission has already committed to convening a Joint Board on or before January 1, 2001 for the purpose of making such an evaluation.<sup>6</sup> It would be little more than folly to attempt to proceed with redefining voice grade access. Not only would embarking on such an effort appear to render the last four years' efforts meaningless, but also, as discussed below, improvement in voice band data performance is not just a rural issue nor can such improvement be achieved simply by redefining voice grade access.

## II. DISCUSSION

6. As a preliminary matter, it is important that there be a common understanding as to the meaning of the terms that are being used. Neither the RUS *ex parte* nor the Public Notice adequately explain the meaning of bandwidth or what is meant by voice grade access at a frequency range of 300 Hz to 3400 Hz. Before the Commission or the carrier can precisely understand the scope of an undertaking to reengineer a network to a new standard, the standard must be precisely defined.

7. It would appear that the intent here is to specify some minimum passband response from the loop that is used by a V.34 modem.<sup>7</sup> Many engineering texts would define the term 'bandwidth' to mean the band between the points on the response curve where the filter circuit exhibits 3dB of loss between prescribed source and load impedances. As discussed further below, this definition of bandwidth is inappropriate in the context of loop design.

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<sup>6</sup> *In the Matter of Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, *Report and Order*, 12 FCC Rcd 8776, 8834-8835 (1997).

8. It must be recognized that every loop experiences some non-zero value of loss at any frequency.<sup>8</sup> Loss is dependent on the source and load impedance used to measure the loss. The first issue, i.e., the fact that there is usually some non-zero value of loss at any frequency, is generally addressed using the notion of ‘Attenuation Distortion.’ This term is used to describe the difference between the loss at the frequency(ies) of interest and the loss at some nominal point in the passband, usually specified as 1000 Hz. To address the second issue, i.e., the loss is a function of the impedances used in measuring the loss, the industry has adopted the convention, when specifying voiceband loss, of representing the CO by 900  $\Omega$  and representing the station equipment with 600  $\Omega$ .<sup>9</sup>

9. Accordingly, for the term bandwidth to have a specific meaning, it should be described in terms of Attenuation Distortion. A conforming loop would meet specific Attenuation Distortion requirements. In measuring or calculating Attenuation Distortion, the impedance at the central office end and the user’s end would be 900  $\Omega$  and 600  $\Omega$ , respectively.

10. Before the Attenuation Distortion requirements can be specified, some basic relationships require explanation. It would appear that one outcome of the request to redefine voice grade access would be to make H88 loaded loops non-conforming loops, i.e., not in

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<sup>7</sup> V.34 is the ITU designation of the Recommendation for modems operating at the data rates discussed in the Public Notice, i.e., 28.8 kbps. There is a more recent recommendation, V.90, for systems operating at higher data rates.

<sup>8</sup> The term “loss” as used here means “insertion loss”. Insertion loss is defined as the differences between (a) the power, delivered to a load, without the circuit ‘inserted’ between the source and the load, and (b) the power delivered to the load with the circuit ‘inserted.’ Both the source and load impedances must be specified.

<sup>9</sup> Attenuation Distortion and the fact that these, i.e., 600  $\Omega$  and 900  $\Omega$ , are the appropriate impedances are illustrated in the specifications for ADSL splitters, in Annex E of ANSI T1.413- (Footnote Continued)

conformance with the new Attenuation Distortion requirements. The term “H88 loaded” refers to the practice of inserting 88 millihenry series inductors (load coils) at regular intervals on longer loops.<sup>10</sup> H88 loading is the most common loading used by BellSouth and other large ILECs. Figure 1, below, illustrates the rather significant impact that loading has on the loss at higher voiceband frequencies.

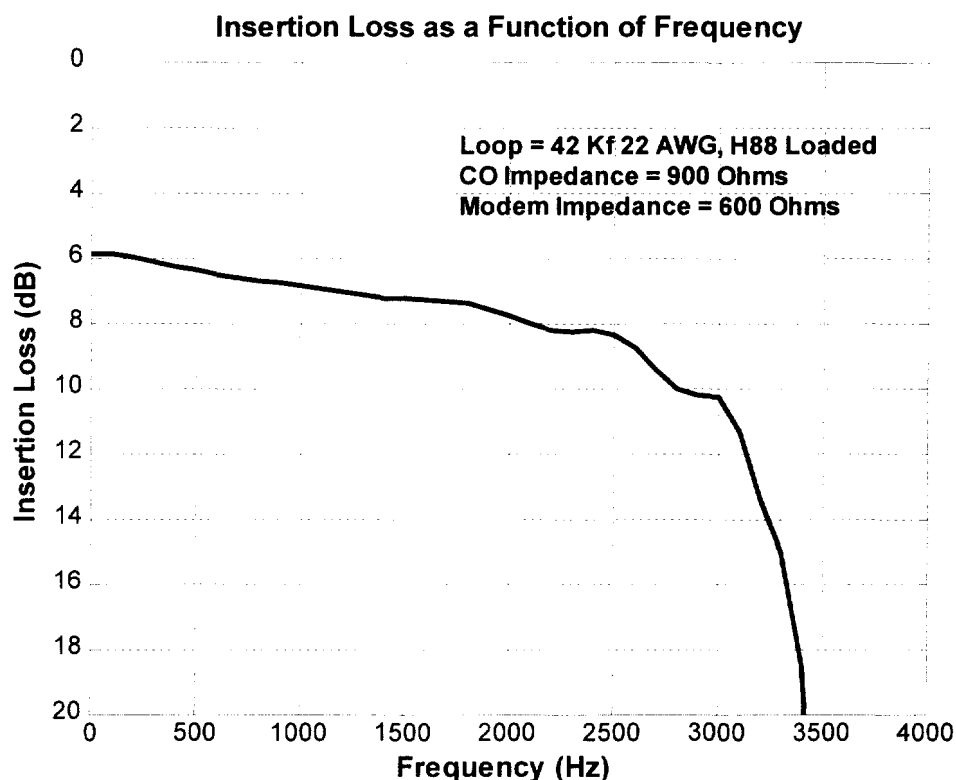


Figure 1

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1998, entitled **Network and Customer Installation Interfaces – Asymmetric Digital Subscriber Line (ADSL) Metallic Interface**.

<sup>10</sup> A technical description of the impact of loading on voice-frequency transmission may be found in section 10.4 of **Transmission and Propagation of Electromagnetic Waves**, K. F. Sander, G. A. L. Reed, Cambridge University Press, 1978.

11. As Figure 1 shows, the steep roll-off introduced by the load coils makes modem transmission at 28.8 kbps impractical.<sup>11</sup> Nevertheless, the appropriate Attenuation Distortion cannot be discerned from this figure. Given that the point of RUS and the state commissions requests are predicated on the view that rural loops should be on a parity with urban loops in terms of transmission performance, then the maximum allowable Attenuation Distortion should be determinable from a set of properly-designed urban loops.

12. BellSouth follows a loop design rule entitled a 'Revised Resistance Design.'<sup>12</sup> This design rule provides the least roll-off on non-loaded loops. Loops meeting this design criteria form the basis for many of the DSL loop testing requirements. Figure 2, below, illustrates the insertion loss, as a function of frequency, of one of the longest loops meeting this design rule.

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<sup>11</sup> As discussed *infra*, the roll-off associated with load coils is not the only impairment to voiceband data performance.

<sup>12</sup> The design rule is documented in SR-TSV-002275, **Notes on the LEC Networks-1994**, Section 7.15.

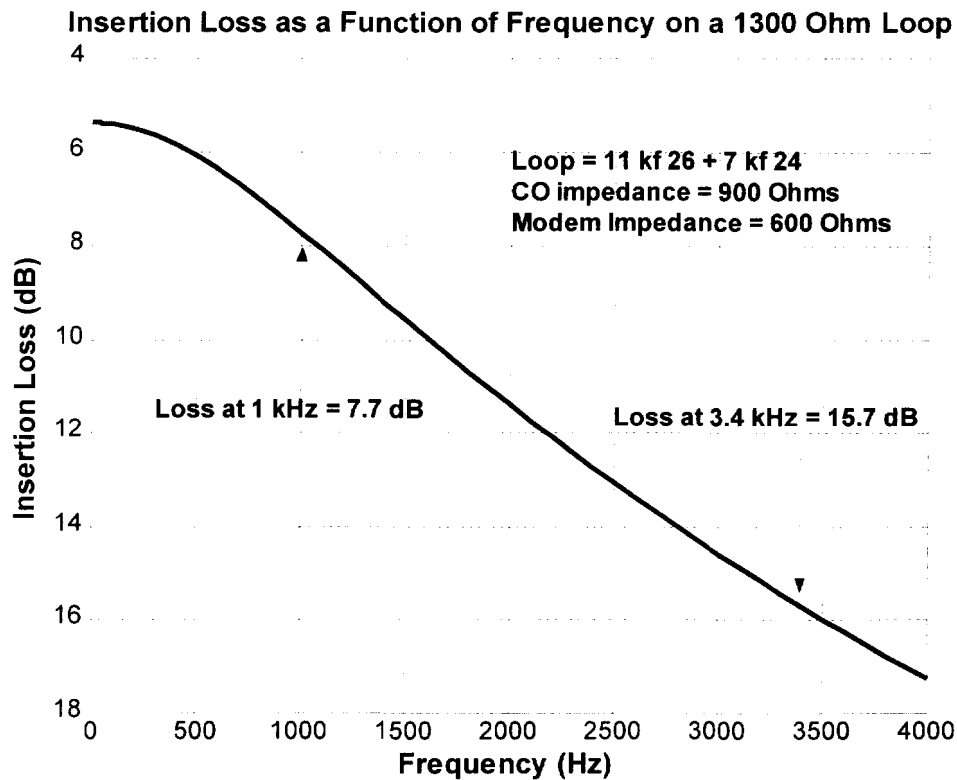


Figure 2

13. As Figure 2 illustrates, the roll-off without load coils is more gradual. Based on BellSouth's experience with this design, properly-designed modems can achieve 28.8 kbps on this loop and the loop can support modern DSL-based broadband services. Thus, this loop design would appear to be the appropriate basis for defining Attenuation Distortion.

14. Next, the frequencies at which the Attenuation Distortion requirements that have to be met have to be established. As an initial matter, it must be recognized that not all loops are metallic. Many loops are provided using Digital Loop Carrier ("DLC"). The sampling rate used in these systems and the associated anti-aliasing filters limit the highest usable frequency to 3.4 kHz. Therefore, the Attenuation Distortion requirement for the high end of the voice band should be no higher than 3.4 kHz.

15. The loop illustrated in Figure 2 exhibits 8dB of Attenuation Distortion (relative to the loss at 1kHz) at that frequency. It would be reasonable that the limit on the loss be on the order of 9dB, in order to allow 1dB for tolerance in the cable construction, measurement equipment, *etc.* Loops provided using DLC, unlike a metallic loop, have a lower frequency below which transmission is not supported. The lower limit is 300 Hz. The roll-off at 300 Hz, though, is much less than 8dB.

16. If the purpose of redefining voice grade access is to invalidate loaded loops, then the following requirements would more appropriately define the parameters on a non-loaded loop:

Attenuation Distortion is defined as the difference between the Insertion Loss at the frequency of interest and the Insertion Loss at 1 kHz. The Insertion Loss shall be measured using a  $600\ \Omega$  impedance at the end-user Network Interface. The Insertion Loss shall be measured using a source with  $900\ \Omega$  impedance at the CO (or to a digital implementation, if the source is embedded in a digital switch). The Attenuation Distortion shall not exceed 9 dB at 3.4 kHz. It shall not exceed 3 dB at 300 Hz.

17. To meet this definition in just the wire centers eligible for universal service support, BellSouth estimates that it would cost approximately between \$1200 to \$1700 a line and that between 65 and 75 percent of the lines would have to be treated. Assuming that current high cost funding remains unchanged and guaranteed, it would take between 5 and 7 years to complete the work to bring the loops for which BellSouth receives universal service support within the revised definition.

18. The time, effort and resources to alter the network to meet a modified definition of voice grade access does not necessarily guarantee voiceband data performance at the levels expected by RUS. Bandwidth is not the only factor that affects voiceband data performance.

There are a variety of factors that can and do affect voiceband data performance and these factors are not just associated with rural areas.

19. For example, voiceband data performance can be impaired if there is back-to-back analog-to-digital (“A/D”) conversions.<sup>13</sup> Such arrangements can arise in cases where DLC is employed in a wire center with a digital switch. Service and other operational considerations may preclude the integration of the DLC bit stream into the digital switch, resulting in tandem A/D conversions (one in the switch and one in the DLC system). The frequency of tandem A/D conversions is no greater in rural areas than in urban areas and thus, any associated impairment of voiceband data performance is not just a rural issue.

20. Another factor which is not limited to rural areas that has a significant impact on V.34 performance is listener echo. Poor listener echo performance arises from less than optimum hybrid balance at both ends of a 4-wire (digital) path. The impairment is particularly significant if interoffice facilities are used in the communication. To the extent the data communications involve an ISP and the ISP uses services that employ integrated modems (*i.e.*, modems that are implemented digitally with a product that is connected to the network using a digital interface), listener echo is not a concern. Nevertheless, redefinition of voice grade access has nothing to do with resolution of listener echo.

21. Another factor that affects voiceband data performance is noise. There are two general classifications of noise, steady state noise and impulse noise. In addition to noise

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<sup>13</sup> In the context of V.34 modems, back-to-back A/D conversions result in additional noise, and hence a lower value of signal-to-noise ratio (“SNR”). With respect to V. 90 modems, such modems employ a different scheme and back-to-back A/D conversions preclude V. 90 operation altogether (*i.e.*, the modems operate as V. 34 modems).

associated with back-to-back A/D conversions, steady state noise can be generated by external sources and is primarily caused by currents coupled into the circuit from power lines.

BellSouth's experience has been that modem performance is measurably affected by noise from power lines.<sup>14</sup> Because loops serving rural areas generally have much longer exposure to nearby power lines, they are more likely to encounter this type of noise impairment to voiceband data performance.

22. Voiceband data performance can also be impaired as a result of impulse noise.

Impulse noise can be produced by transient events such as the running of electric machinery.

Often, the primary noise-causing devices are located within the dwelling of the user. In any event, impulse noise and the associated impairment of voiceband data performance is neither a rural phenomenon nor is it remedied by modifying the definition of voice grade access.

### III. CONCLUSION

23. It is abundantly clear that modifying the definition of voice grade access is not a panacea for improving voiceband data performance. Several factors influence voiceband data performance and these factors are independent of whether the loops are rural or urban or of the definition of voice grade access.


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<sup>14</sup> It should be noted that noise from power lines occurs at the power-line frequency (60 Hz) and its harmonics. Because the average listener cannot detect power (signal or noise) at low frequencies as easily as they can detect power at higher voiceband frequencies, it is the harmonics of 60 Hz that dominate audible noise. In fact, this tendency is 'built in' to the noise weighting filters in IEEE 743-1995, **IEEE Standard Equipment Requirements and Measurement Techniques for Analog Transmission Parameters for Telecommunications**. BellSouth's experience is that some modems are strongly affected by the (potentially very large) 60 Hz component, which poses little or no degradation to voice service.

24. The new high cost federal universal service fund has yet to be fully implemented. After all of the time and effort that has been expended to reach the starting point for the new fund, the Commission would be ill-advised to take any action at this time, such as modifying the definition of voice grade access, that would jeopardize the fund's implementation. The Commission already is committed to review the operation of the fund in 2001. At that time, the Commission can evaluate the fund based on actual operating data and determine if any adjustments, including the definition of voice grade access, would better achieve the statutory goals set forth in Section 254 of the Act.

Respectfully submitted,

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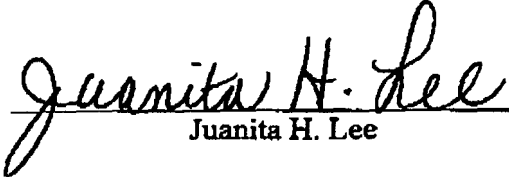
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Date: January 19, 2000

**CERTIFICATE OF SERVICE**

I do hereby certify that I have this 19<sup>th</sup> day of January 2000 served the following parties to this action with a copy of the foregoing COMMENTS by hand delivery or by placing a true and correct copy of the same in the United States Mail, postage prepaid, addressed to the parties on the attached service list.

  
\_\_\_\_\_  
Juanita H. Lee

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